

Fundamentals of  
Team-Based Learning:

**Evaluating Multiple  
Choice Questions for  
RATs and Applications**

**REBECCA MCCARTER**

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# INTRODUCTION & ABOUT YOUR EBOOK



Hi. My name is Beck McCarter and I am an expert in empowering pedagogies and digital learning. I'm an accredited TBL Trainer-Consultant and the course leader for the Fundamentals of Team-Based Learning Programme.

I created this eBook as a companion to the third workshop in the programme, Evaluating Multiple Choice Questions for Readiness Assurance Tests and Application Exercises, and it contains all the preparatory material you will need to participate in the workshop.

I teach you about TBL by using TBL, partly so that you have an opportunity to experience everything from the student perspective but also because I've found that it's without doubt the most effective way to teach and learn.

In order to get the most out of the workshop, please take time to read through this booklet in advance and consider how the TBL approach would work for your subject and context.

I look forward to working with you!

*Beck*

Let's connect!



@beckmccarter

# Types of MCQs

Multiple choice questions (MCQs) form the core of the Readiness Assurance Process (RAP) because they are an efficient and reliable way to assess a range of learning outcomes.

A multiple choice question consists of a problem, the stem, and a selection of possible answers which are called distractors.

Which action is most likely to ensure a successful TBL experience?

Stem

- a) Setting multiple low-stakes assessment weightings
- b) Using Technology Enhanced Learning (TEL) tools
- c) Booking a room designed for active learning
- d) Scheduling weekly Readiness Assurance tests



Distractors

There are two basic categories of MCQs: those where a learner must select all appropriate distractors (True-False) and those where a learner must select one most appropriate response (Single Best Answer). True-False types should be avoided as they are not very reliable and the Single Best Answer (SBA) question type makes it easier to assess higher order thinking.



True or False



Single Best Answer



# Writing Your Questions

How many questions? If you've developed learning outcomes and are using backwards design then you should already have a clear idea of the most important concepts to be tested.

Remember, this is low stakes assessment to indicate whether students are ready to attempt the next phase: show restraint and limit your questions to the minimum necessary to achieve the learning goals.



## WHERE TO START?

Start by writing the stem. A well-written stem is a stand-alone question that you should be able to answer without seeing any distractors. It should also be grammatically complete and written so that one distractor is indisputably correct. Avoid negative stems and don't use words in the stem that you later repeat in the distractors.

The appropriate verb to use will link to the defined learning outcome you want to test. Excerpted from Gronlund's 'How to Make Achievement Tests and Assessments', the following tables contain some suggested phrases to use in your stem that tackle different types of questions.

# Illustrative Knowledge Questions

## Terminology

What word means the same as \_\_? Which statement best defines the term \_\_? In this sentence, what is the meaning of the word \_\_?

## Specific facts

Where would you find \_\_? Who first discovered \_\_? What is the name of \_\_?

## Conventions

What is the correct form for \_\_? Which statement indicates correct usage of \_\_? Which of the following rules applies to \_\_?

## Trends & sequences

Which of the following best describes the trend of \_\_? Which is the most important cause of \_\_? Which of the following indicates the proper order of \_\_?

## Classifications

What are the main types of \_\_? What are the major classifications of \_\_? What are the characteristics of \_\_?

## Criteria

Which of the following is a criterion for judging \_\_? What is the most important criterion for selecting \_\_? What criteria are used to classify \_\_?

## Methodology

What method is used for \_\_? What is the best way to \_\_? What would be the first step in making \_\_?

## Principles

Which statement best expresses the principle of \_\_? Which statement best summarizes the belief that \_\_? Which of the following principles best explains \_\_?

## Theories & structures

Which statement is most consistent with the theory of \_\_? Which of the following best describes the structure of \_\_? What evidence best supports the theory of \_\_?

## Comprehension Questions

Which of the following is an example of \_\_\_\_\_?

What is the main thought expressed by \_\_\_\_\_?

What are the main differences between \_\_\_\_\_?

What are the common characteristics of \_\_\_\_\_?

Which of the following is another form of \_\_\_\_\_?

Which of the following best explains \_\_\_\_\_?

Which of the following best summarizes \_\_\_\_\_?

Which of the following best illustrates \_\_\_\_\_?

What do you predict would happen if \_\_\_\_\_?

What trend do you predict in \_\_\_\_\_?

## Application Questions

Which of the following methods is best for \_\_\_\_\_?

What steps should be followed in applying \_\_\_\_\_?

Which situation would require the use of \_\_\_\_\_?

Which principle would be best for solving \_\_\_\_\_?

What procedure is best for improving \_\_\_\_\_?

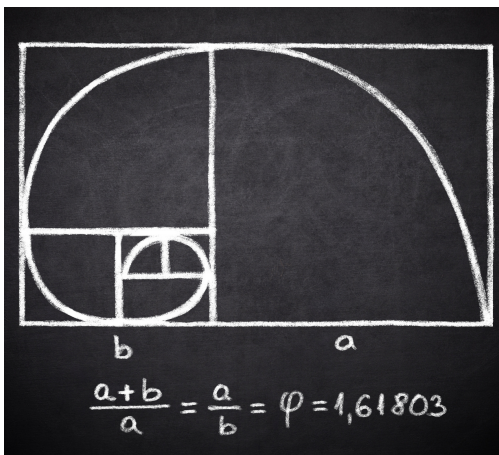
What procedure is best for constructing \_\_\_\_\_?

What procedure is best for correcting \_\_\_\_\_?

Which of the following is the best plan for \_\_\_\_\_?

Which of the following provides the proper sequence for \_\_\_\_\_?

What is the most probable effect of \_\_\_\_\_?



### What proportion?

Custom and practice used to be to aim for a 1:2 blend of recall to simple application questions. Concerns regarding preserving academic integrity have prompted a move towards using simple application question types almost exclusively, especially in online delivery.

# Creating Distractors



## DISTRACTOR CHECKLIST

Clearly a correct answer

Avoid all/none of the above

Gramatically consistent

Similar length

Numerical answers in order

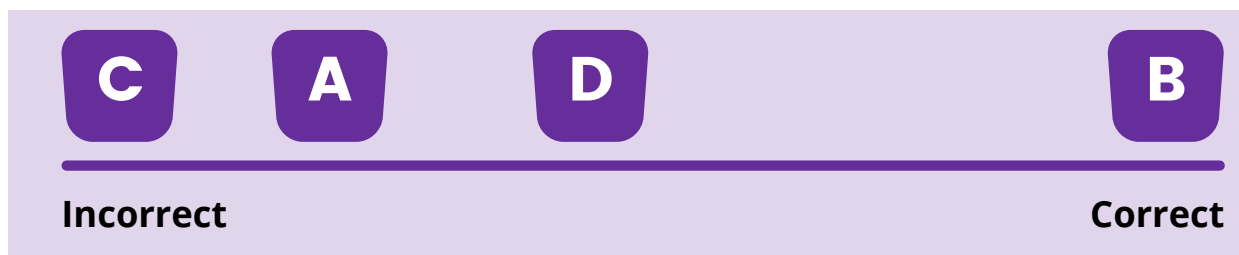
Generating distractors can be the most challenging part of writing high quality MCQs. The best distractors tend to be either:

- accurate statements that don't address the full requirements of the problem
- incorrect statements that might seem correct to the student.

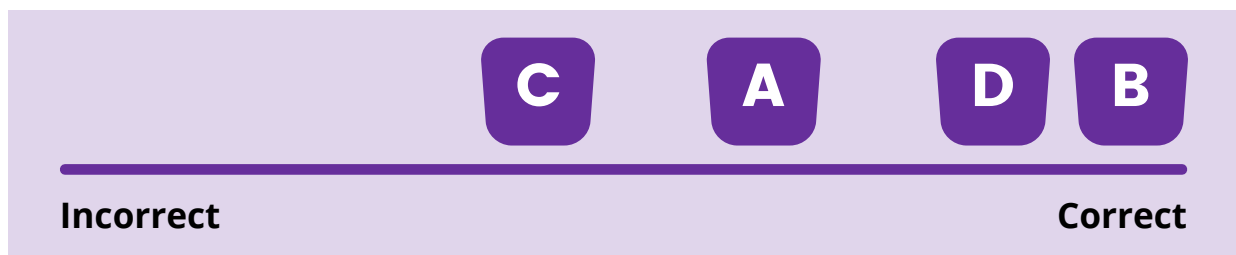
Each incorrect option should be plausible but clearly wrong.

Sibley (2014) recommends mapping your answer options on a continuum from most to least correct to help develop a holistic view of the question: where options cluster towards the incorrect response the question will be unlikely to stimulate the desired level of team discussion. Where clustering around the correct response will significantly increase the level of difficulty of the question. Ideally, you should provide distractors that require a reasonable level of discernment in your learners but that can be clearly ranked across the spectrum.

**This question is likely to be too easy...**



**This question is likely to be too difficult...**



**This question is likely to hit the Goldilocks zone and be 'just right'...**





# Quality Assurance

One of the advantages of using software to run the Readiness Assurance Process is that you can automatically generate statistical reports, commonly called 'Item Analysis', which provide insights into the quality of your questions.

## 01. Discrimination Index

The discrimination index measures how well a question can differentiate between candidates who have understood the content and those still in a liminal space. It should link their performance on each question to their overall test performance so that the one predicts the other.



The discrimination index value ranges from  $-1$  to  $+1$  with any item that scores over  $0.2$  considered acceptable as students who have understood the material are more likely to select the correct answer than those who have a weaker understanding of the topic.

## 02. Difficulty Index



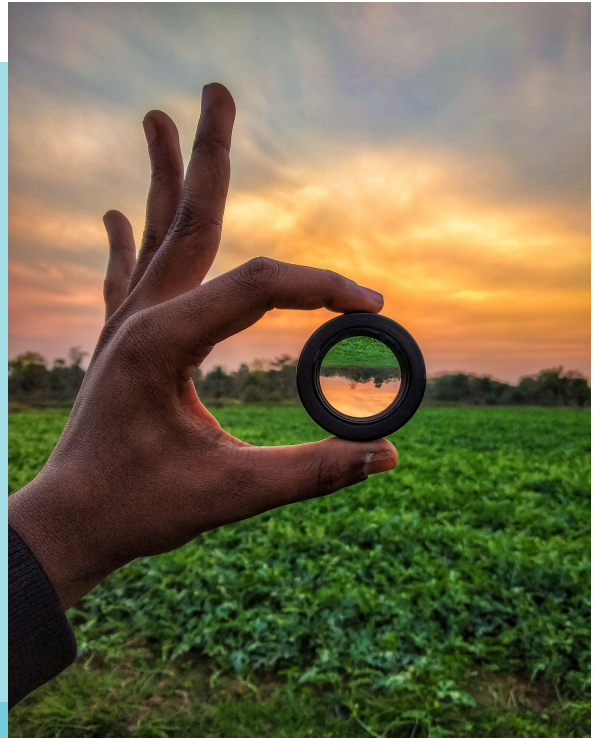
The difficulty index measures how easy a question is by determining the proportion of students who get it right.

The closer the difficulty score is to zero, the more difficult that question is. A well written question should score between  $0.3$ – $0.7$  and ideally the questions you include in the RAP should have a range of difficulty levels.

# When might you use Item Analysis?

## Clarification Phase

You can use item analysis to flag the questions your students found challenging in the RAP. You can then use that information to plan and prioritise the content of the following clarification session to ensure that the most troublesome concepts are given extra class time to resolve.



## Refining the unit

Once you've finished teaching a unit, review the scores and remove or revise any questions or distractors that don't meet the standard as part of your quality enhancement routine.